

Towards the implementation of the SEEK filter with the Hycom model

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Last Fiscal Year

- use the low resolution of the North Atlantic configuration: $1/3^\circ$, sigma0
- large processing regarding the Mean SSH, thanks to O.M. Smedstad: how to combine different Mean SSH products ?
- the Mediteranean Sea:
it is an issue for the HYCOM model and the assimilation of altimetry. It was partly fixed → take care about the merge of Atlantic Mean SSH + Mediteranean Mean SSH

Since Summer

- start to work with the high resolution configuration: $1/12^\circ$, sigma2*
- it's not only a more expensive configuration, it also needs to change some parameters of the assimilation system

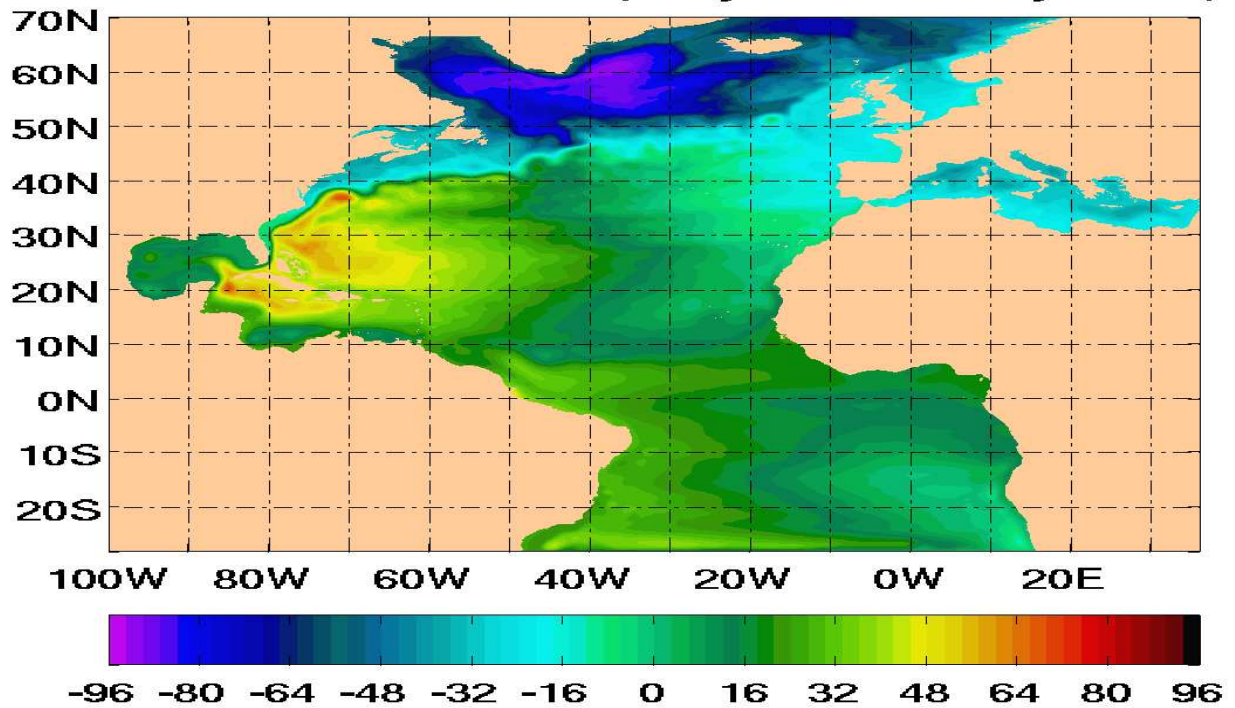
The 1/12° North Atlantic configuration, a brief description (see T. Townsend's talk)

- source code: src_2.1.27_sig2a_28_mpi
experiment number: 11.2
- use the FCT advection scheme, KPP
- no bottom boundary layer (BBL)
- northern and southern boundaries:
33-120 day e-folding time (GDEM3 climatology)
- forcing fields: use ECMWF mean + FNMOC
- no SST relaxation
- SSS GDEM3 relaxation
- interannual run: July 1998 → September 2004
- thermobaricity effect on SSH (sigma2*):
don't forget this !!

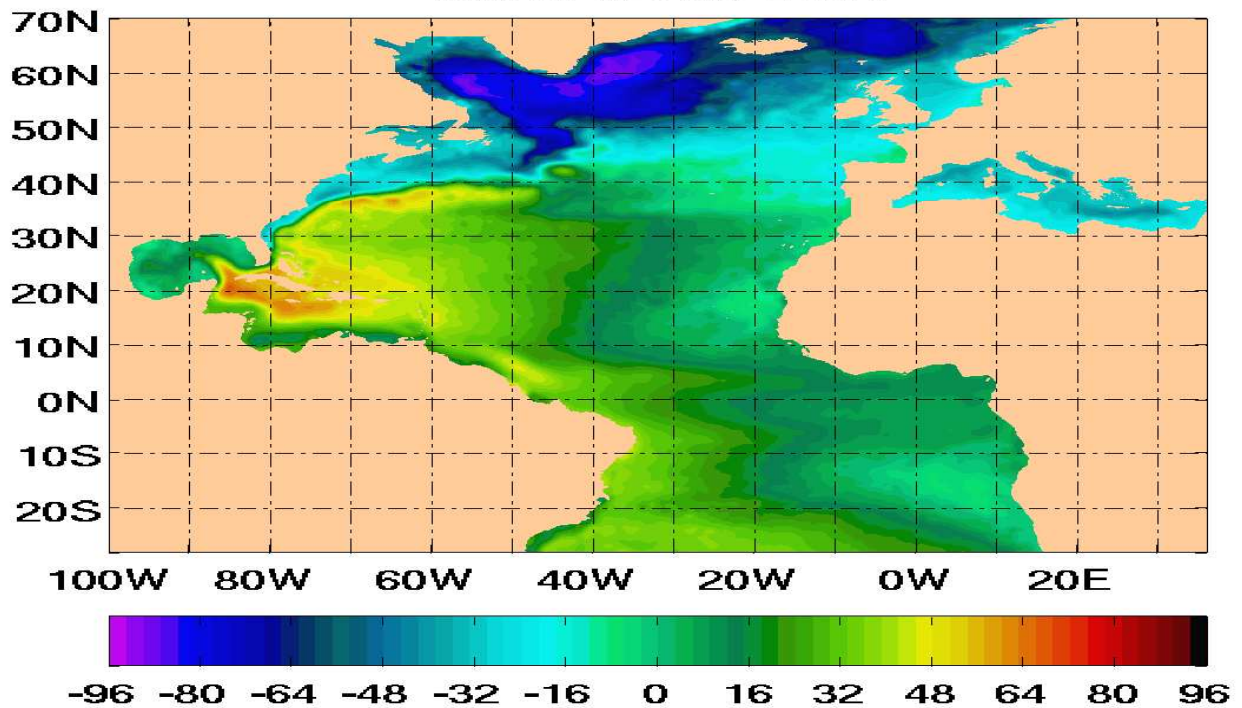
The assimilated data: SSH, SST, SSS

- **AVHRR SST**: ~9km resolution (from JPL)
 - clouds → large area without data during winter
 - suggestion: to add an other product (MODAS)
- **GDEM3 SSS** climatology (monthly)
- **SLA**: Topex, ERS2, GFO, Jason1, Envisat when available
- **Mean SSH**: based onto Niiler's Mean SSH
 - + processing
 - Mediteranean Sea: add the HYCOM Mean SSH (sigma0 run)
 - North Sea: from the Nowcast/Forecast System
 - spatial interpolation onto the HYCOM grid
 - ...

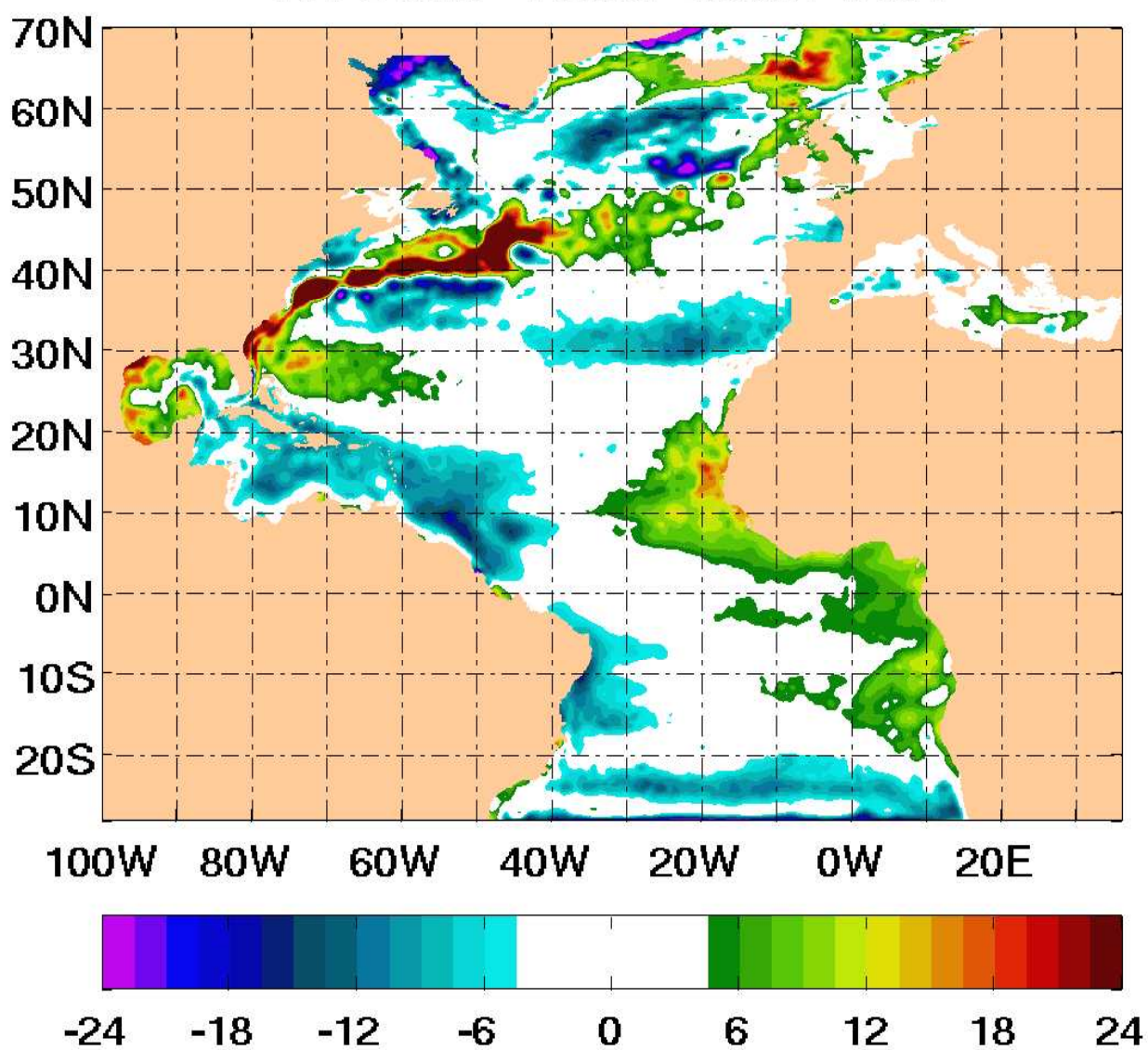
HYCOM Mean SSH (July 1998 - July 2001)



Niiler Mean SSH

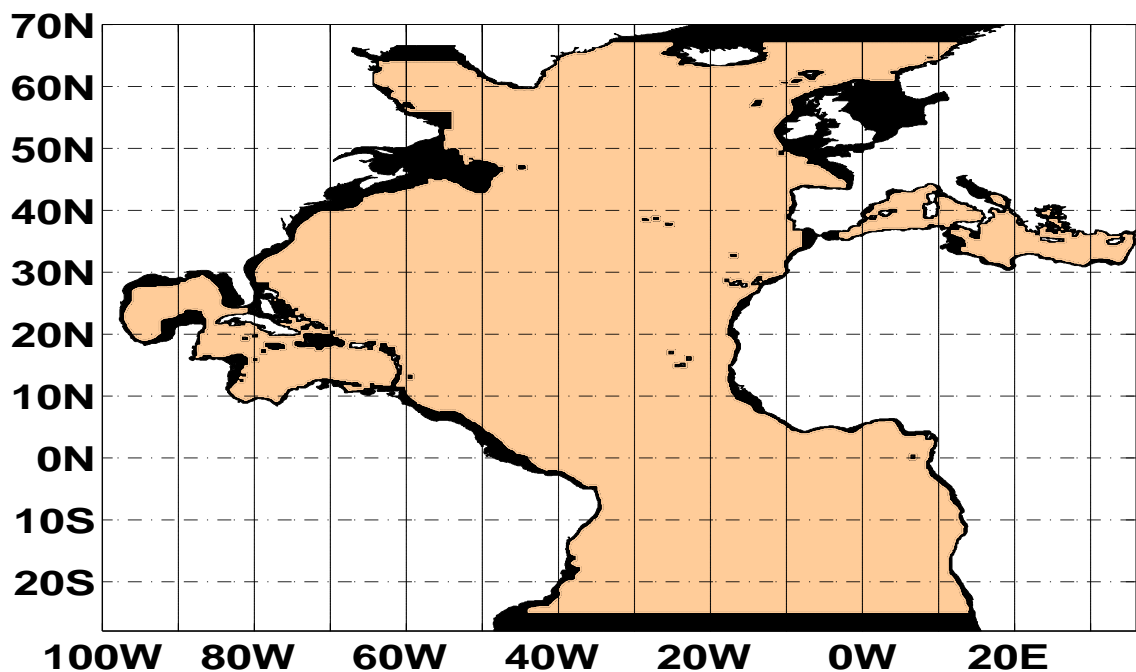


HYCOM - Niiler Mean SSH



- **Mask SLA data:**

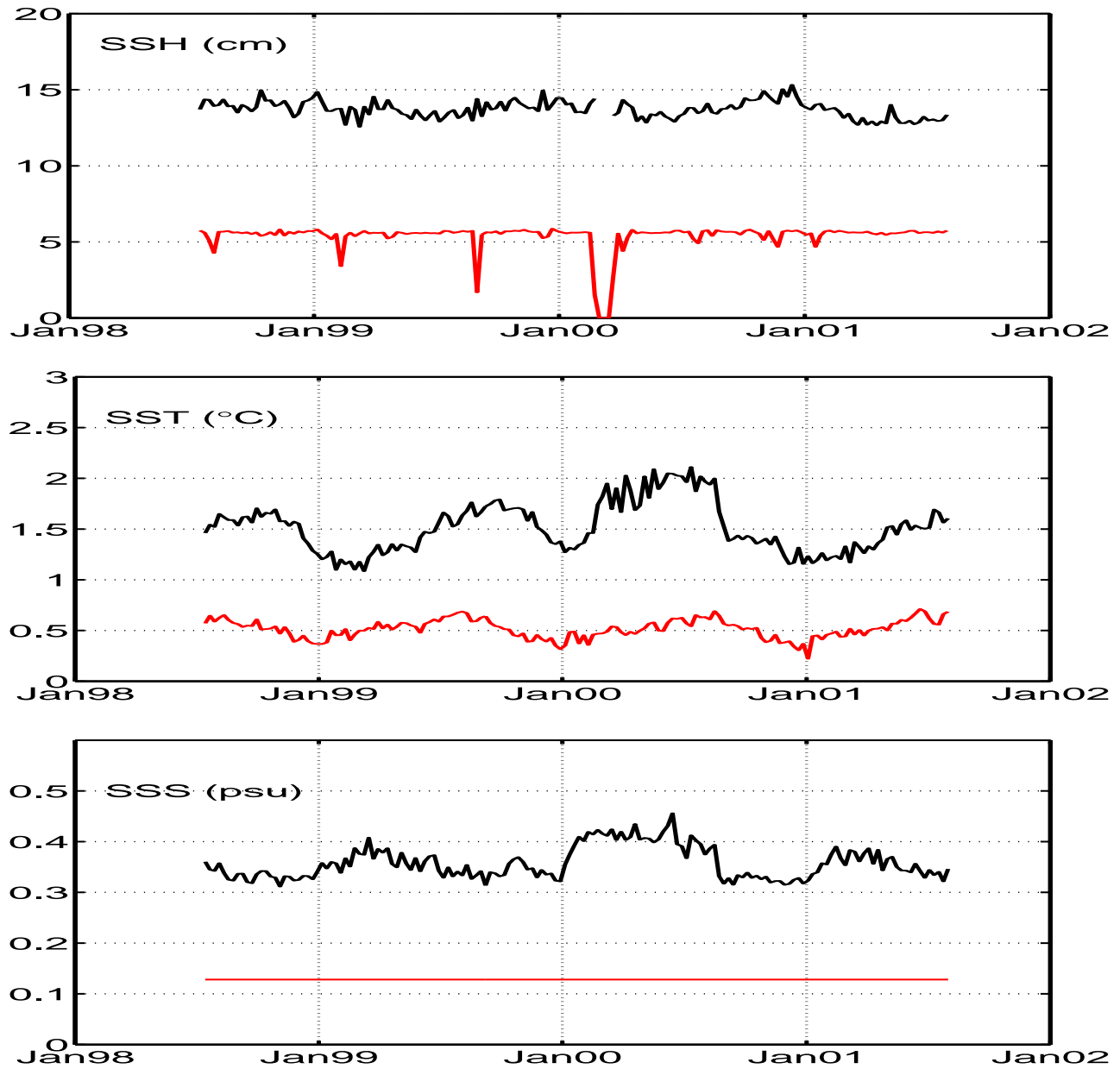
- problem with the SLA signal near coasts
- problem with the tidal model onto shelves
- bad Niiler's Mean SSH \rightarrow mask



- no assimilation near Gibraltar Strait
- if $\text{abs}(\text{SLA}) \geq 1.5$ meter: data is removed

The Rms misfit of the free run

— rms misfit — data number



the first analysis stage: July, 8th 1998

- assimilation frequency: 7 days
- estimation of the error covariance matrix:
Eof analysis , 14 days frequency,
July 1998 → July 2001
- local analysis: same as $1/3^\circ$
size of the influence data bubble is 4°

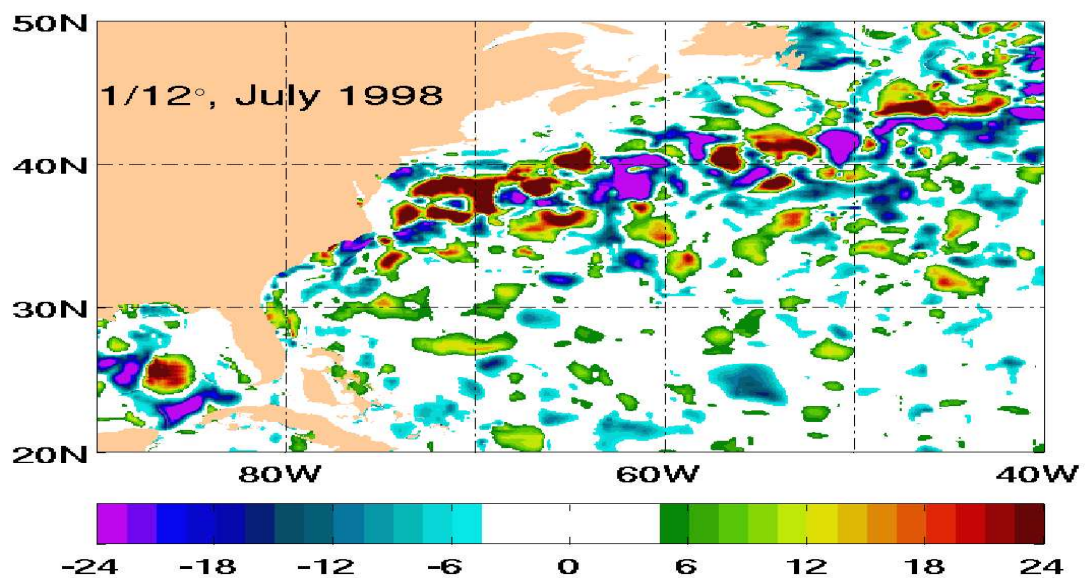
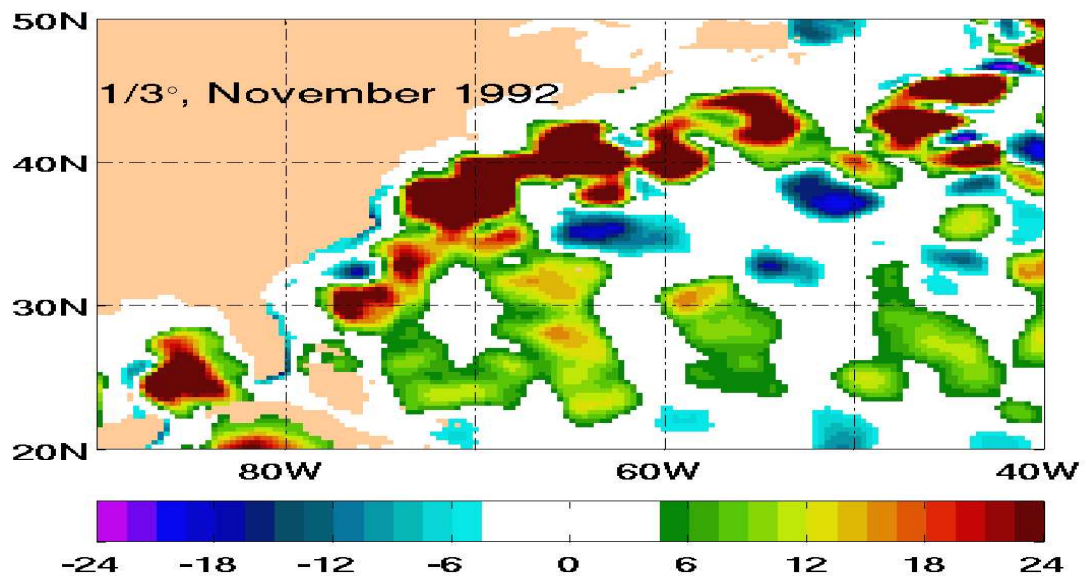
there is a reduction of the Rms misfit:

14cm → 10cm (Topex SLA)

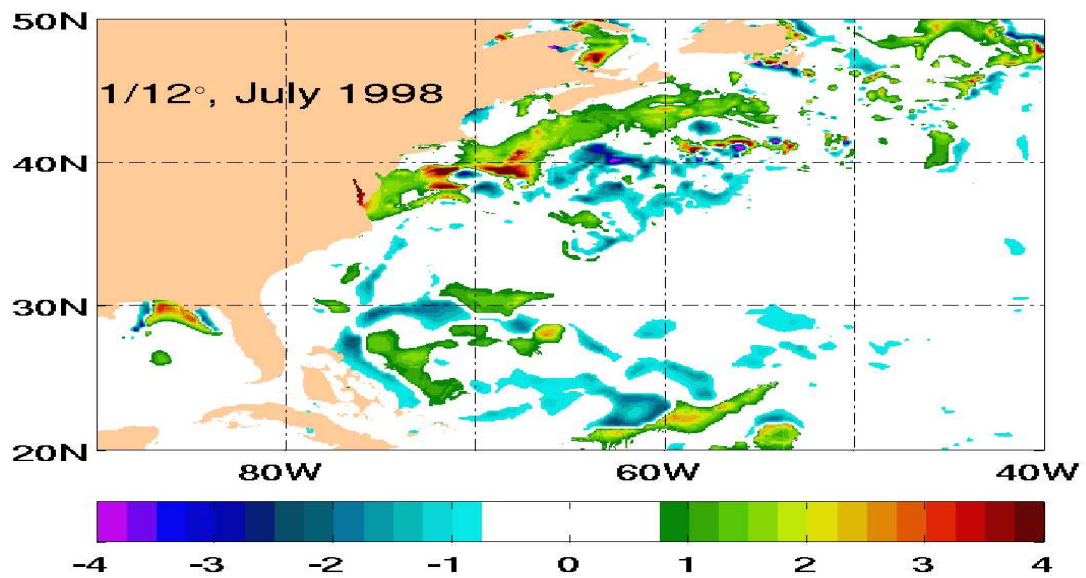
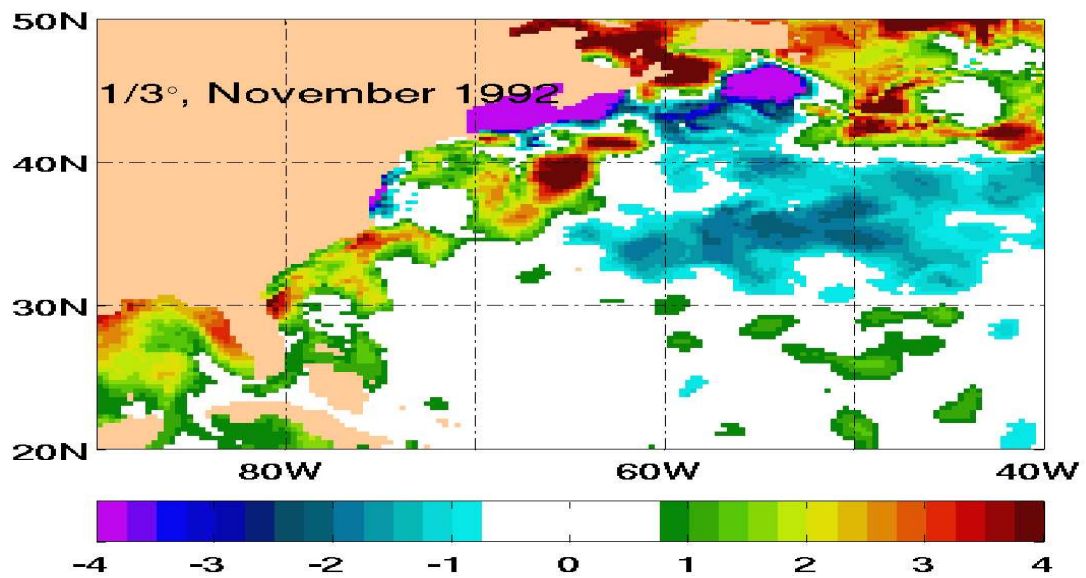
1.5°C → 0.8°C (AVHRR SST)

but the analysis SSH, SST or SSS is too noisy

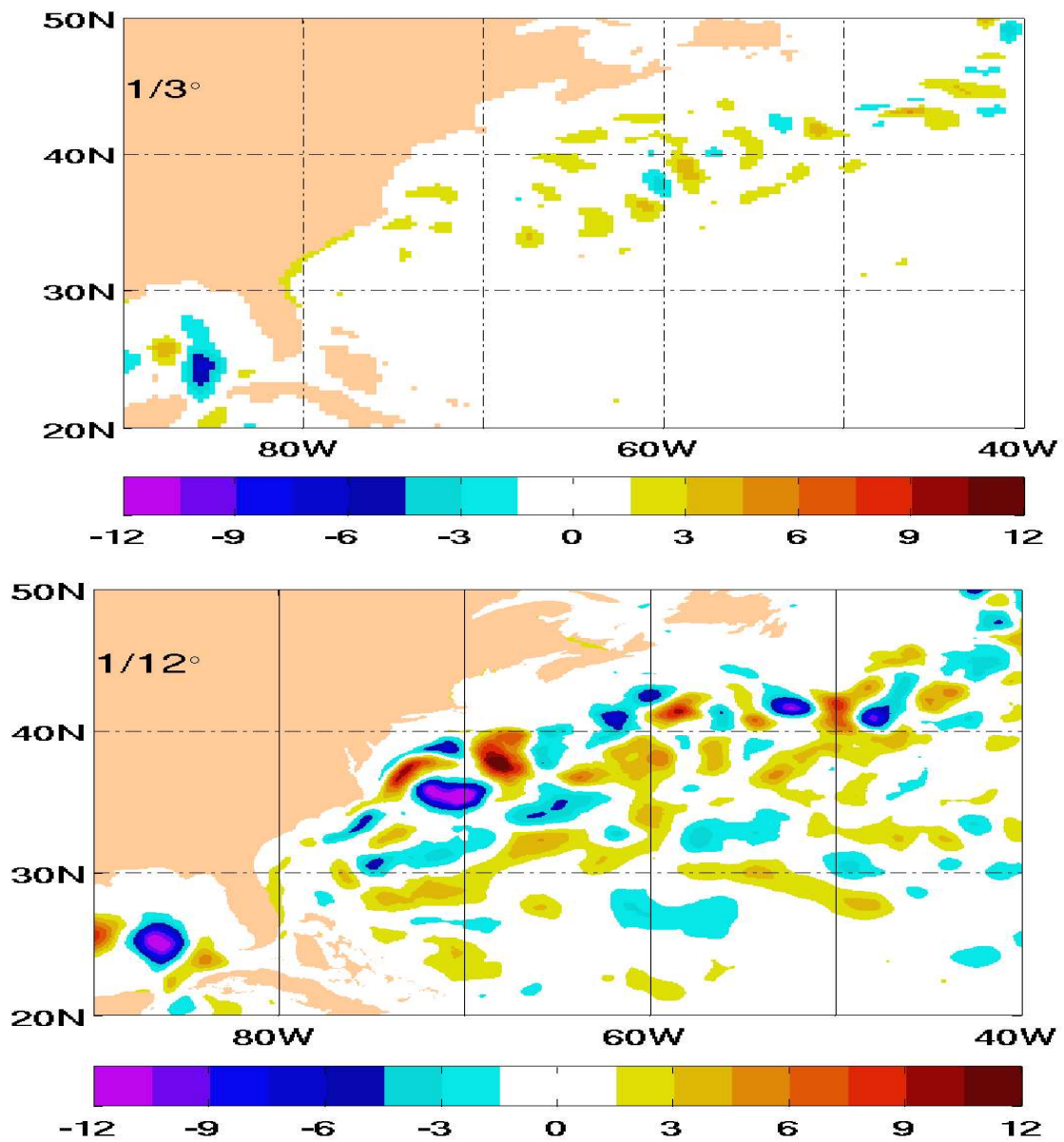
the first SSH analysis stage: $xf-xa$



the first SST analysis stage: xf-xa



Eof 10 - SSH variable



It means that you need to change some parameters of the assimilation system. Which one ?

Note that the assimilation scheme has to correct the bias (large scale) + eddies (small scale)

example of parameters:

- the number of Eofs
- the size of the influence data bubble: $4^\circ \rightarrow ?$
- smooth snapshots before the estimation of the error covariance matrix
- to split the analysis stage in 2 parts: large / small scale
 - during the first stages: reduce the bias (SSH, SST, SSS) with a smooth error covariance matrix
 - then to use an unsmooth error covariance matrix
 - to use something like a "leap-frog error covariance matrix"

It's underway . . .

Conclusion

there are some problems regarding the analysis stage, not only because of the size but because the dynamics is different

- is it impossible to solve these problems: no
- does it take a while: probably
- when it is fixed, we can focus on the restart of the model:
it might be straightforward (same as $1/3^\circ$)
or not ...